SmartState®

SC Centers of Economic Excellence

2012–2013 ANNUAL REPORT

GLOBAL POSITIONING

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MISSION

GLOBAL POSITIONING

The South Carolina SmartState® Program serves the public interest by **creating incentives** *for the state's research universities, in cooperation with other institutions of higher education in the state, to* **raise capital** *from non-state sources to fund endowments for specialized research professorships. These professorships in turn serve as the nucleus for unique,* **university-based research centers** *which cultivate critical, public-private industrial partnerships, expand the state's knowledge base, create well-paying jobs,* **enhance economic opportunities**, *and improve the quality of life for the people of South Carolina.*

INTRODUCTION BY REGAN VOIT, CHAIR

The SmartState Program does not receive taxpayer dollars to fund economic development-related initiatives to benefit the state; it is funded through revenue generated by the South Carolina Education Lottery, which is then matched dollar-for-dollar by non-state businesses and foundations.

When the SmartState Program was established by the South Carolina General Assembly in 2002, there were high hopes that this visionary program could propel the state's economy into a more prosperous future. The SmartState Program was designed as a fire starter, bringing our research universities together with businesses in search of innovation, collaboration, and talented, well-prepared employees.

Little more than a decade later, the SmartState Program has lived up to its promise. The program has attracted more than $1.4 billion in investments in our state from businesses and foundations resulting from the $180 million of non-tax revenue generated from the State Education Lottery. That investment is responsible for creating more than 8,000 jobs, and continues to attract a who's who of corporate partners such as BMW, Boeing, GM, SCANA, Fluor, and many more eager to pursue joint research, hire our university graduates and create economic opportunities together.

The theme of this annual report is Global Positioning, and that is exactly what the SmartState Program is achieving for our state. South Carolina is clearly positioning itself as a global leader in the automotive, aviation, healthcare, and energy industries. The SmartState Program is an important impetus for collaboration and investment. Consider the following:

- MUSC's SmartState Center for Clinical Effectiveness and Patient Safety has succeeded in redefining how healthcare professionals are trained in South Carolina. Instead of practicing on real patients, medical and nursing students learn on high-tech patient simulators. With the help of this Center, Midlands Technical College recently secured a $25 million federal grant to be used to train even more students for good-paying jobs using simulators.
- CU-ICAR, Clemson's automotive research campus, counts BMW, Ford, GM, Mazda and others among its corporate partners. In 2013, automotive companies sponsored 46 percent of its research. Some 93 percent of students who graduate from CU-ICAR programs are employed in the auto industry, 26 percent in South Carolina.
- The University of South Carolina is leveraging its intellectual and physical assets in nanotechnology, engineering, and physics to help develop next generation airliners. Aviation is a critical industry for South Carolina and the world; Boeing is involved in USC's efforts.
- Energy generation, storage, distribution, and security are global issues. Clemson is establishing a $150 million energy research and commercial testing campus in North Charleston to address these very concerns. The potential for attracting industry and creating jobs in South Carolina's energy sector is huge. Already, interest is high; Duke Energy, GE Energy, Intertech, Santee Cooper, and SCANA are all partners.

In the past 10 years, we have implemented well thought out legislation that proved to be extremely successful in creating new high-paying positions in South Carolina. Going forward, we have identified ways to improve the program to make it even more effective for the next decade. South Carolina's SmartState Program has made our state a leader in science and technology development. As our legislative leaders implement improvements in the program, our leadership position will continue around the world.

Regan Voit, Chair
SmartState Review Board

REVIEW BOARD

The SmartState Review Board consists of eleven members who serve three-year terms. Three are appointed by the Governor, three by the President Pro Tempore of the State Senate, three by the Speaker of the House of Representatives, one by the Senate Finance Committee, and one by the Chairman of the House Ways and Means Committee. The Review Board oversees operations of the SmartState Program. The presidents of the three research universities serve as ex-officio, non-voting board members.

Regan Voit, Chair

Appointed by Chairman of the Senate Finance Committee

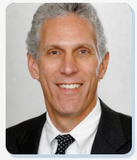
Melvin Williams, Vice Chair

Appointed by President Pro Tempore of the Senate

Michael Couick

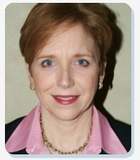
Appointed by President Pro Tempore of the Senate

J. Lyles Glenn



Appointed by the Governor

Lisa Main



Appointed by Speaker of the House

Keith Munson, Secretary

Appointed by the Governor

Robert W. Pearce, Jr.

Appointed by Speaker of the House

Patrick W. Turner

Appointed by President Pro Tempore of the Senate

Patricia E. Wilson

Appointed by Speaker of the House

SOUTH CAROLINA'S SENIOR RESEARCH UNIVERSITIES

The SmartState Program funds Centers of Economic Excellence at South Carolina's three senior research universities: Clemson University, the Medical University of South Carolina (MUSC), and the University of South Carolina. Other state universities such as South Carolina State University and the College of Charleston are included as collaborative research partners.

In 2002, members of the South Carolina General Assembly recognized the critical role research universities play in advancing innovation, creating economic and educational opportunities, and improving overall quality of life for the state's citizens when it acted with foresight and an eye to the future, passing the enabling legislation of the SmartState Program. Today, other states look to South Carolina's SmartState Program as the model of university-based public-private partnerships that foster innovation, launch companies, and create jobs.

Clemson University is home to more than 19,000 students. Located in South Carolina's Upstate region, Clemson offers approximately 80 undergraduate and 110 graduate programs. Ranked as the 25th best national public university by *U.S. News & World Report*, Clemson is a vibrant student-centered community that thrives on leadership, collaboration, and a winning spirit in academics, athletics and life. To become one of the country's top-tier research universities, Clemson has combined the scientific and technological horsepower of a major research university with the academic and social environment of a small college. CU-ICAR, Clemson University's International Center for Automotive Research, is a world model for university and business research partnerships.

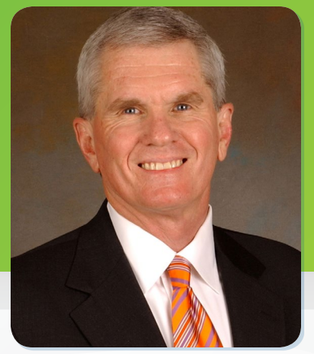
The Medical University of South Carolina (MUSC) has served the citizens of South Carolina since 1824. MUSC has expanded from a small private college for the training of physicians to a state university with a medical center and six colleges for the education of a broad range of health professionals, biomedical scientists, and other health-related personnel. MUSC has colleges in medicine, nursing, dental medicine, pharmacy, health professions, and graduate studies. MUSC Health is among the state's largest and most innovative health systems.

Established in 1805, the **University of South Carolina (USC)** is home to more than 200 years of history and tradition, with more than 45,000 students at its eight campuses across the state. The main campus in Columbia offers 324 degree programs through its 14 colleges and schools, which include medical schools in Columbia and Greenville, and a law school in Columbia. The Sonoco International Business Department within the Darla Moore School of Business offers an undergraduate international business major that is consistently ranked as #1 by *U.S. News & World Report*. USC is one of only 63 public universities listed by the Carnegie Foundation in the highest tier of research institutions in the United States.

CLEMSON UNIVERSITY

MUSC MEDICAL UNIVERSITY of SOUTH CAROLINA

UNIVERSITY OF SOUTH CAROLINA



"The SmartState Program has been a game-changer. It was conceived by people in leadership positions who actually understood the dollars and cents value of making long-term investments in higher education and research to support economic growth. The genius of it is the private sector match requirement. For example, there would be no CU-ICAR (Clemson International Center for Automotive Research) without the Endowed Chairs funded jointly by SmartState and BMW (two chairs), Michelin, and Timken. With these chairs, Clemson has recruited world-class faculty to drive innovation and support a growing automotive and transportation sector."

— **Jim Barker, FAIA**
President
Clemson University

"During my 13 year tenure as president of MUSC, no state initiative contributed as much to the advancement of MUSC than the SmartState program. By providing the resources to recruit outstanding scientists, we were able to build nationally prominent programs in drug discovery, regenerative medicine, biomedical imaging, and a number of other areas. Equally important, these new recruits are attracting considerable high tech economic activity in the state through the creation of start-up companies and partnerships with existing industry. This investment will pay dividends for years to come."

— **Ray Greenberg, M.D., Ph.D.**
President
Medical University of South Carolina

"Since its creation, the SmartState Program has attracted more than $1.4 billion in outside investment to South Carolina and created more than 8,000 new, high-paying jobs in businesses large and small. In areas as diverse as nuclear energy, advanced materials, tourism and aerospace, the SmartState Program leverages USC's research expertise to directly benefit the state's economy. For the more than 40 companies and non-profits that have invested at least $500,000 in the program—including the Fluor Corporation and The Duke Endowment—SmartState is a vital pipeline to innovative research available nowhere else in the world."

— **Harris Pastides, Ph.D.**
President
University of South Carolina

CLEMSON UNIVERSITY

" The Smart Grid Technology Center is the most comprehensive approach to transforming the energy grid in America. The potential for attracting industry and creating jobs in South Carolina's energy sector is huge. "

DARREN DAWSON, Ph.D.

SMARTSTATE CENTER FOR

SMART GRID TECHNOLOGY

SMART GRID TECHNOLOGY

America's electric grid was hailed as the greatest engineering achievement of the 20th century. Today, the grid – and others like it around the world – is on the verge of a renaissance.

Exploding energy demands, the rise of sustainable and alternative energy production, rapidly evolving information technology and demand for data, and the necessity of avoiding and circumventing outages and disruptions point to an unequivocal need for a major transformation of a system vital to society and the global economy.

This summer, the SmartState Program approved Clemson University's new Smart Grid Technology Center. The goal is to leverage the state's strong presence in the energy industry and Clemson's unique strengths in engineering, materials science, transportation, and entrepreneurship thus creating economic development opportunities and jobs for the state.

Housed at a new $150 million energy campus in North Charleston, the Center will emphasize smart grid and clean energy technology (wind and solar) along with energy storage and conversion. The centerpiece of the campus is a $100 million wind turbine test facility, which will provide commercial testing to companies like GE Energy. Smart Grid research will focus on merging energy and information technologies to create a highly robust 21st century smart grid that is more resilient, reliable, flexible, and interactive with end users to optimize energy supply, use, and security. A Smart Grid Interface System will allow real time simulations with real hardware.

Though in its infancy, the Smart Grid Technology Center has attracted unprecedented corporate support. Duke Energy has invested $5 million. SCE&G provided a new substation specifically for the wind turbine testing facility. Other economic development partners include GE Energy, Intertech, Santee Cooper, and SCANA. Additionally, there are two partner consortiums focused on the grid integration and wind turbine test facilities with 26 members.

There is no question the Smart Grid Technology Center positions South Carolina to be a significant global competitor in the growing smart grid market, which is projected to attract $2 trillion in investment by 2030. By providing vision, resources, and synergy for public and private partners, South Carolina has the power to lead in the development of new products and services and in job creation.

CORPORATE PARTNER

DUKE ENERGY®

GLOBAL POSITIONING THROUGH STEM

MOST WANTED EMPLOYEES

In 2009, the US Department of Labor reported eight of the top ten most wanted employees had degrees in STEM fields: accounting, computer science, electrical engineering, mechanical engineering, information sciences, computer engineering, civil engineering, and economics and finance.

South Carolina's economic fortunes, like that of the world, depend on a workforce rooted in STEM (science, technology, engineering and mathematics). The fastest growing job sectors, the most sought after employees, and the highest salaries are in STEM fields.

The SmartState Program recognizes the critical importance of preparing South Carolina's young people for the future, which is why SmartState is a partner in the South Carolina Governor's School for Science & Mathematics' (GSSM) Summer Program for Research Interns. For six weeks between their junior and senior years, GSSM students conduct research at university or industrial facilities under the mentorship of professional scientists, entrepreneurs, or engineers.

In the summer of 2013, 97 GSSM students were partnered with SmartState Endowed Chairs at Clemson University, MUSC, and USC based on their career interests. They spent their internships conducting graduate level research in areas including automotive engineering, cancer research, nanotechnology, and future fuels.

Dr. Kenneth Tew, chair, SmartState Council of Chairs, says the unique internship program brings STEM to life for the high school students, showing them the exciting opportunities available in science, technology, engineering and mathematics career fields in South Carolina.

"If we want to keep South Carolina's best and brightest students in our universities, we must show them the incredible opportunities available to them here at home," said Dr. Tew. "Young people are South Carolina's future business leaders, entrepreneurs, researchers, and policymakers. Allowing them to work alongside the brightest people in STEM is very powerful, and opens the door to exciting possibilities at our state's universities and job market."

A TOP STEM SCHOOL

Located in Hartsville, SC, the South Carolina Governor's School for Science and Mathematics is one of only 12 specialized, residential high schools in the nation for academically motivated juniors and seniors pursuing studies in science, technology, engineering, and math.

FAST GROWING & HIGH PAYING

According to the U. S. Labor Department, six of the fastest growing occupations and their median wages are in STEM fields:

$70,930	FINANCIAL EXAMINERS
$71,100	NETWORK SYSTEMS AND DATA COMMUNICATIONS ANALYSTS
$72,590	MEDICAL SCIENTISTS
$77,400	BIOMEDICAL ENGINEERS
$81,230	PHYSICIAN ASSISTANTS
$82,840	BIOCHEMISTS AND BIOPHYSICISTS

From 2008-2018

UNIVERSITY OF SOUTH CAROLINA

" Planes are a huge, huge export market for the United States. This new SmartState Center and its focus on the aviation industry represent a tremendous opportunity for South Carolina. We have to do this right! "

KENNETH REIFSNIDER, Ph.D.

SMARTSTATE CENTER FOR MULTIPHYSICS OF HETEROGENEOUS ENGINEERED FUNCTIONAL MATERIALS & STRUCTURES

AVIATION MATERIALS

Commercial aviation is the backbone of the American economy, driving more than $1 trillion in annual economic activity and responsible for nearly 10 million well-paying American jobs.

When multinational aviation corporation Boeing announced it would build its new 787 Dreamliner in North Charleston in 2009, it was cause for celebration in South Carolina. News reports indicated initial plans called for creating 3,800 jobs. Then, April 2013 media reports announced Boeing would invest another $1 billion and add at least 2,000 more jobs at its North Charleston 787 campus by 2020, citing steep demand for commercial airplanes over the next two decades. Most recently, in November 2013, Boeing broke ground on a new jet propulsion plant in North Charleston, the company's first major South Carolina investment not associated with the 787.

"These jobs are included in our commitment that we announced earlier this year," Boeing South Carolina spokesman Rob Gross said in the *Charleston Post & Courier*, which added that the Chicago-based aerospace giant currently employs about 6,100 workers in the region.

South Carolina's position in the global aviation industry is climbing. But, the aviation industry is highly competitive. Companies need lighter, stronger aircraft that require less fuel to fly and maintenance to operate. Seeing an opportunity, the University of South Carolina (USC) proposed the nation's only SmartState Center focused on developing and testing the advanced materials needed for modern, high performance aircraft.

This summer, the SmartState Program approved USC's Center for Multiphysics of Heterogenous Engineered Functional Materials & Structures. The new Center leverages USC's expertise in nanocomposite materials.

In the past, aircraft were made of metal. Today's aircraft are made largely of composite materials specifically chosen for certain properties. The significant advantage is cost; aircraft made of these advanced materials are more economical to operate and maintain.

USC researchers and graduate students are now working with South Carolina's aviation industry to study how the thermal, mechanical, and electrical properties of composite materials influence the global performance of aircraft. The research is complex, thus dialogue between USC and industry engineers is essential. Dr. Kenneth Reifsnider of USC explains: "We hold technical discussions with them to brainstorm. There's good synergy. We do why, they do how."

Such relationships take a long time to build, but yield tremendous results for all parties. University researchers gain a better understanding of industry needs and industry partners gain valuable scientific insight from university researchers. Students also benefit from research, internships, and jobs in aviation.

Says Reifsnider, "Work is more exciting with partners from our state's rapidly growing aviation industry. The opportunities before us have everyone's eyes lit up."

SMARTSTATE PROGRAM RETURN ON INVESTMENT

In 2002, the South Carolina General Assembly had the vision to establish the SmartState Program. The legislation authorizes the state's three public research institutions—Clemson University, the Medical University of South Carolina, and the University of South Carolina—to use state lottery funds, matched with equal non-state investment, to create Centers of Economic Excellence in research areas that would advance South Carolina's economy.

Today, there are 51 SmartState Centers in six industry-focused Smart Clusters that position South Carolina well in the global economy: Advanced Materials & Nanotechnology, Automotive and Transportation, Biomedical, Future Fuels, Information Science, and Pharmaceutical. Each Center is awarded between $2 million to $5 million in state lottery funds, which must be matched on a dollar-for-dollar basis with non-state funds from corporations or other entities. The list of SmartState Center supporters includes BMW, BASF, Bank of America Foundation, Westinghouse, and more supporters.

The program supports SmartState Endowed Chairs, world-renowned scientists and engineers who were recruited to lead the Centers. By investing in talent and technology, the Smart-State Program is fueling the state's knowledge economy and creating high-paying jobs and an improved standard of living in South Carolina.*

Economic growth requires vision, investment, and courage. It is driven by the creation of new technologies, company formation, business expansion, and job creation. Economic growth benefits all because it helps support a better quality of life.

DR. JOSEPH C. VON NESSEN, RESEARCH ECONOMIST

MOORE SCHOOL OF BUSINESS

UNIVERSITY OF SOUTH CAROLINA

* As of FY 2012, more than 8,000 high-paying, knowledge-based economy jobs; the average salary of these jobs is substantially higher than the average salary statewide. The jobs include 422 full-time equivalent SmartState personnel, 32 start-up company employees, and 1,159 corporate relocation personnel. Also included are an estimated nearly 6,500 new jobs that have resulted from the impact of more than $400 million in extramural research funding brought into SC's economy by SmartState Endowed chairs and their research teams. The job numbers for start-up and corporate relations are not complete as figures were not available from all companies.

SMARTSTATE PROGRAM BY THE NUMBERS

3
RESEARCH UNIVERSITIES
CLEMSON, MUSC, USC

6
INDUSTRY CLUSTERS[1]

51
SMARTSTATE CENTERS OF ECONOMIC EXCELLENCE

44
SMARTSTATE ENDOWED CHAIRS APPOINTED
(OF THE 89 CREATED)

$197.6M
STATE FUNDS INVESTED[2]

$1.4B
TOTAL INVESTMENT[3]

36
INVESTORS OVER $500,000[4]

24
START-UP COMPANIES[4]

28
CORPORATE RELOCATIONS[4]

1 Industry-focused research is conducted in six areas of global importance: Advanced Materials and Nanotechnology, Automotive and Transportation, Biomedical, Energy, Information Science, and Pharmaceutical.

2 Includes $180 million from the State Education Lottery appropriations and $17.6 million accrued interest from SmartState Program endowment.

3 The figure reported is as of the end of FY 2012 and includes $191.6M in committed non-state matching funds, $529.8M from corporate infrastructure investment, $408.4 million in research grants, and $307.5M in other committed grants and pledges. As of the end of FY 2013, the committed non-state matching funds at $197.6M fully matches the state investment of $197.6 million. Of the committed non-state matching funds as of FY 2013, $180.2M (91%) has been paid. Also as of FY 2013, research grants have increased to $501.8M and other committed grants to $457 million.

4 See page 14 for a listing of investors, start-ups and corporate relocations.

INVESTORS, START-UPS, AND CORPORATE RELOCATIONS IN SC

CORPORATE AND ORGANIZATIONAL INVESTORS

More than three dozen companies have invested $500,000 or more in the SmartState Program.

- Abney Foundation
- BASF
- Bank of America Foundation
- Biomass Gas & Electric
- BlueCross BlueShield Foundation of SC
- BMW
- Comporium Group
- Daniel Island Company
- Dialysis Clinics, Inc.
- Duke Energy Foundation
- Electric Cooperatives of South Carolina
- Fluor Corporation
- Force Protection Industries
- General Atomics
- George B. Sibert Annuity
- GlaxoSmithKline
- Greenville Hospital System
- Health Sciences South Carolina
- J.E. Sirrine Foundation
- Kellogg Foundation
- Kentwool
- Michelin
- Okuma
- Palmetto Health
- PalmettoNet
- Research to Prevent Blindness
- Robert Wood Johnson Foundation
- Samuel Freeman / Donaldson Charitable Trust
- Santee Cooper
- Smith & Nephew
- Spartanburg Regional Healthcare System
- The Duke Endowment
- The Spaulding Paolozzi Foundation
- Timken
- Toyota
- Westinghouse

START-UP COMPANIES

Start-up companies that were founded as a result of research at USC, MUSC, and Clemson University:

- Advanced Photonic Crystals
- Fibro Therapeutics, Inc.
- FirstString Research
- Hydrogen Hybrid, LLC
- ImmoMod, Inc.
- MagAssemble, LLC
- MicroVide
- MitoChem Therapeutics, LLC
- MitoHealth
- NextGenEn, Inc.
- NXT
- Parallel Permeation, Inc.
- Palmetto Fuel Cell Technologies, LLC
- Perfect Mixing, LLC
- Protara, LLC
- SAGE Energy Solutions
- SchnellGen
- SemiAllogen, Inc
- SimTunes
- Smart Innovations, LLC
- South Carolina Science Solutions, LLC
- Specialty Custom Fibers, Inc.
- Tetramer Technologies
- Vortex Biotechnology

CORPORATE RELOCATIONS

Companies that have relocated to South Carolina to take advantage of the expertise, resources, and graduates in the SmartState Program:

- American Titanium Manufacturing
- American Titanium Works Technology Center
- BMW Information Technology Research Center (ITRC)
- CADFEM U.S.*
- Cephos
- Clean Energy
- Cooliemon* Technologies*
- Computech*
- DreamWeaver*
- Environmental and Health Inc. (EHG)
- Fields Group, LLC.*
- Focus Chemicals*
- Greenway Energy, LLC
- Innoventure*
- Intec U.S. Inc.
- JTEKT Technology Center
- Mallet Technology*
- Mumford Industries*
- Proterra, Inc.
- Roding*
- Sage Automotive Interiors*
- Simpack, Inc.
- ThermoPur Technologies*
- Tigges*
- Toho Tenax*
- Trulite

* In May 2012, CU-ICAR opened the doors to the Center for Emerging Technologies (CET) facility, its first multi-tenant building. CET provides office, administrative, and laboratory space for transportation, technology, and energy sectors. These companies have positioned themselves on the CU-ICAR campus to be close to the SmartState Endowed Chairs and their research teams.

SMARTSTATE JOBS IN FOCUS:

Creating Opportunities for South Carolinians

Orangeburg native Melanie Jefferson sees divine intervention in her job with SmartState Endowed Chair Dr. Chanita Hughes-Halbert. She also credits her expanding role as a research coordinator working on five major cancer disparity studies at the MUSC Hollings Cancer Center to the SmartState Program.

Melanie Jefferson
Research Coordinator
MUSC Hollings Cancer Center

"I earned my undergraduate degree at South Carolina State University and my Master's in Public Health Administration at the University of South Carolina. About the time I was hired at the Hollings Cancer Center, I lost my father to cancer. It really brought meaning to my work."

Jefferson was working with another cancer researcher when she learned Dr. Hughes-Halbert was recruited as the AT&T Distinguished Endowed Chair in Cancer Equity at MUSC. Jefferson had recently begun working on her Ph.D. and saw an opportunity to learn from one of the leading researchers in the nation in minority health and cancer prevention and control. "Dr. Hughes-Halbert came to MUSC from the University of Pennsylvania and brought new ideas and a different perspective, things I needed to develop my own research career. I was very fortunate to join her team," said Jefferson.

Jefferson's job is demanding and rewarding and comes with tremendous responsibilities. Jefferson works with Dr. Hughes-Halbert in overseeing research projects, making sure grant funding runs smoothly and that all researchers and administrators stay on task.

"Without Dr. Hughes-Halbert and the SmartState Program, I would not have this wonderful career opportunity. Once I earn my Ph.D., I want to continue working in South Carolina. As a native, I understand the state's nuances and what's needed to help overcome disparities in cancer care and outcomes. Helping the people of South Carolina achieve better health is very rewarding," said Jefferson.

Without Dr. Hughes-Halbert and the SmartState Program, I would not have this wonderful career opportunity.

SMARTSTATE JOBS IN FOCUS:

Attracting Creativity

Creativity comes in many forms. Creative people are essential in solving problems in business, health care, and government. The opportunity to be creative is one thing that caused Dr. Todd Thornburg to leave a position with Wake Forest University in North Carolina to start a new career with the Center for Healthcare Quality.

Dr. Thornburg is a senior program manager with the Center for Information Technology Implementation Assistance South Carolina (CITIA-SC), an initiative of the SmartState Center for Health Care Quality that has helped more than 1,300 doctors across South Carolina implement information technology into their practices.

Here, I have the opportunity to work with professionals across the entire state of South Carolina and really make a difference.

"At Wake Forest, I was working with the university only. Here, I have the opportunity to work with professionals across the entire state of South Carolina and really make a difference for doctors, their patients, and health researchers," said Dr. Thornburg.

CITIA-SC is the result of a $5.6 million federal grant secured by Health Sciences South Carolina and the SmartState Center for Healthcare Quality. Dr. Thornburg has collaborated with the S.C. Office of Rural Health, the S.C. Primary Health Care Association, and Carolinas Center for Medical Excellence to assist doctors across the state in using information technology to improve patient care and practice efficiency. He credits the SmartState Program and its vision for creating his rewarding job opportunity.

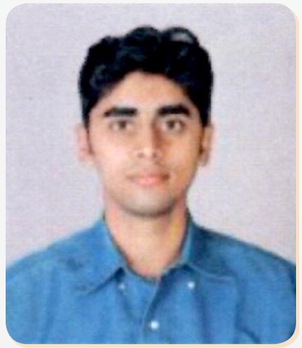
"The SmartState Program attracts creativity from all over. I've learned a lot about how to utilize the incredible talent South Carolina has in business, academics and nonprofits to get things done. It's exciting."

Dr. Todd Thornburg
Senior Program Manager
Center for Healthcare Quality

SMARTSTATE JOBS IN FOCUS:

A Fortunate Find

Pushkar Joshi's Internet search for a graduate program in automotive engineering led him to Clemson University's International Center for Automotive Research (CU-ICAR). It was a fortunate find; two years later, he is an engine control engineer for EcoDual, a leading provider of dual fuel systems for the heavy-duty diesel truck industry.



Pushkar Joshi
Engine Control Engineer
EcoDual

Joshi smiled at the memory. "Most automotive engineering master's programs give you book smarts. CU-ICAR is unique; it's book smarts and hands-on building of automotive parts and vehicles. You learn by doing real world engineering with highly capable professors in a safe environment. If you make mistakes, you learn how to deal with them and avoid them in the future."

EcoDual President and CEO Mike Donoughe said it is important to have well-prepared people available to hire in South Carolina, particularly for high-tech companies like EcoDual that rely on ongoing research and development in a specialized industry.

"Pushkar understands the need to blend research and application to the real world. His well-grounded education in engineering and pragmatism make him an attractive employee for EcoDual," explained Donoughe, a 30-year veteran of the automotive industry, which includes leadership roles at Chrysler and Tesla Motors.

Joshi oversees a joint development project between EcoDual and CU-ICAR that seeks to improve the fuel systems of semi tractor trucks and reduce operational costs. At age 26, he calls it his "dream job."

"Working for a smaller company like EcoDual gives me a lot of responsibility and freedom. I don't just sit at a desk all day; I'm working on groundbreaking projects. I'm on speaking terms with our CEO! I am definitely fortunate to do what I love and have fun for a living," said Joshi.

Most automotive engineering master's programs give you book smarts. CU-ICAR is unique; it's book smarts and hands-on building of automotive parts and vehicles.

MUSC

HEALTHCARE SIMULATION

> *" Even with 12 simulation centers across South Carolina, 1,400 software training scenarios being marketed worldwide, and a $25 million grant to expand simulation training, there's so much more we can do. "*

JOHN J. SCHAEFER, III, MD

ENDOWED CHAIR, SMARTSTATE CENTER FOR CLINICAL EFFECTIVENESS & PATIENT SAFETY

Dr. John J. Schaefer, III, an expert in healthcare simulation training, was among the first endowed chairs recruited to the SmartState Program in 2006.

At the time, the use of software-driven patient simulators to train medical, nursing, and allied health was a luxury few universities or technical colleges could afford. At $300,000 each, human simulators were out of reach to an industry desperately in need of a more effective clinical training.

The vision of the Center for Clinical Effectiveness & Patient Safety is to make South Carolina a world leader in healthcare simulation training. Working with business ally Laerdal, a European healthcare simulation company, Schaefer has succeeded in making human simulation training more accessible and affordable in South Carolina. Twelve simulation-training centers have been established with university, hospital, and technical college partners, including world-class training centers at MUSC and the Greenville Health System.

He also succeeded in commoditizing the healthcare simulation market, bringing the price of a high fidelity simulator—lifelike adult, child, and infant mannequins—down to about $30,000. When Schaefer joined the SmartState Program, there were less than 3,000 healthcare simulations in use in America. Today, there are more than 60,000.

Commercial success followed. In 2012, Schaefer launched SimTunes, an online store that sells simulation-training software developed in South Carolina to users around the world. He has a patent pending on a mannequin that delivers a baby on its own and mimics emergency situations. The specialized simulator goes on the market in January 2014. Lippincott nursing textbooks now come with companion simulation training scenarios.

In early October, Schaefer was part of an effort led by Midlands Technical College that secured a $25 million grant to implement the Better Occupational Outcomes and Simulation Training program (BOOST) from the U.S. Department of Labor, Employment and Training Administration. Midlands Tech and others, including Central Carolina Technical College in Sumter and Florence-Darlington Technical College, will now use simulation training to fast track the education of entry-level healthcare employees with fewer resources and greater efficiency.

This SmartState Center is making great strides. The next target is the multi-million dollar healthcare certification and licensure industry. Simulation, with its ability to objectively measure a student's knowledge, has the potential to transform how healthcare professionals around the world become certified or licensed and create more opportunities for educating the health care workforce.

BUSINESS ALLY

Laerdal
helping save lives

SMARTSTATE CENTERS AND ENDOWED CHAIRS

2012 – 2013 THE YEAR IN REVIEW

The work of South Carolina's SmartState Centers is exciting, groundbreaking, and of critical importance to the state, nation, and world. What follows is a brief overview of each Center. To learn more about the SmartState Program, visit SmartStateSC.org.

TOTALS FOR SMARTSTATE PROGRAM

51 SmartState Program Centers Awarded

89 SmartState Endowed Chairs Created

44 SmartState Endowed Chairs Appointed

45 SmartState Endowed Chairs Remaining to be Appointed

	CLEMSON UNIVERSITY	UNIVERSITY OF SOUTH CAROLINA	MUSC MEDICAL UNIVERSITY of SOUTH CAROLINA
	13	18	20
	16	30	43
	6	18	20
	10	12	23

Program totals as of fiscal year end, June 30, 2013. Research Institutions Totals, Awarded, and State Funds Drawn for each institution are tallied on the fiscal agent in cases of joint proposals. Chairs are tallied based on the assigned institution. For updated information on Centers and program totals, contact the S.C. Commission on Higher Education or visit SmartStatesc.org.

ADVANCED MATERIALS & NANOTECHNOLOGY

ADVANCED FIBER-BASED MATERIALS

Award Date: 2006

State Award Amount: $4 million

University: Clemson

Endowed Chair:
Dr. Marek Urban
J.E. Sirrine Foundation Endowed Chair in Advanced Fiber-Based Materials

Corporate Partner:
J.E. Sirrine Textile Foundation

External Funding Above Match:
$7.7 million

Research Focus:
To provide the vehicle for repositioning existing manufacturing resources to support new industry opportunities based on advanced fiber-based products.

ENVIRONMENTAL NANOSCIENCE AND RISK

Award Date: 2008

State Award Amount: $3 million

University: USC

Endowed Chair:
Dr. Jamie Lead
Nanoenvironmental Science & Risk

External Funding Above Match:
$1.5 million

Research Focus:
Understand the fundamental properties of nanomaterials and nanomaterials-environment interaction and use these principles to understand and help reduce impacts of nanomaterals as used as well as develop and innovate nanotechnological applications.

EXPERIMENTAL NANOSCALE PHYSICS

Award Date: 2003

State Award Amount: $4 million

University: USC

Endowed Chair:
Dr. Richard Webb

External Funding Above Match:
$3.5 million

Research Focus:
Perform basic and applied research of potential spintronic optoelectronic and nanoelectronic devices and/or materials for future applications in information processing, high-speed, high-density electronics, and bio, chemical and radiation sensing.

MULTIPHYSICS OF HETEROGENEOUS ENGINEERED FUNCTIONAL MATERIALS & STRUCTURES

Award Date: 2013

State Award Amount: $2 million

University: USC

Endowed Chair(s):
USC is recruiting one endowed chair.

Research Focus:
The development and supply of engineered materials for high technology industries such as aerospace by providing a foundation of research and development that will enable and enhance growth in the engineered materials field. Specific examples of research and development include: Lightning strike and EMF management, structural integrity, energy storage, essential power for commercial aircraft, and multi-physics-based micro/nano mechanics of dielectric materials.

OPTICAL MATERIALS/PHOTONICS

Award Date: 2004

State Award Amount: $5 million

University: Clemson

Endowed Chair:
Clemson is recruiting *J.E. Sirrine Textile Foundation Endowed Chair in Optical Fiber*.

Corporate Partner:
J.E. Sirrine Textile Foundation

External Funding Above Match:
$18.8 million

Research Focus:
Conduct materials research and recruit and mentor graduate students with a focus on domestic scholars. Identify and foster the latest technologies and initiate partnerships with top national research universities and laboratories, Aid South Carolina industry and economic development partners in the transfer of technology from Clemson to the public sector, and participate in the recruitment of optical technology firms to South Carolina.

POLYMER NANOCOMPOSITES

Award Date: 2004

State Award Amount: $3.5 million

University: USC

Endowed Chair:
Dr. Brian Benicewicz
Materials Science & Engineering

Corporate Partners:
Michelin North American, BASF, U.S. Navy, PBI Performance Products

External Funding Above Match:
$8.8 million

Research Focus:
Development of synthetic tools needed to precisely control the environment or interface between nanoparticles and polymer matrix applicable to optics, electronics, biological, medical, and structural material applications.

AUTOMOTIVE & TRANSPORTATION

AUTOMOTIVE DESIGN AND DEVELOPMENT

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. Zoran Filipi
Timken Endowed Chair in Automotive Design & Development

Corporate Partners:
Hertz Corporation, Duke Energy

External Funding Above Match:
$1.6 million

Research Focus:
Focuses on the research and design of advanced powertrains for internal combustion engines and hybrid and electric vehicles, along with lightweight design and materials, functional integration and structural dynamics for vehicles.

SUPPLY CHAIN OPTIMIZATION AND LOGISTICS

Award Date: 2005

State Award Amount: $2 million

University: Clemson

Endowed Chair:
Dr. Scott Mason
Fluor Endowed Chair in Supply Chain Optimization & Logistics

Corporate Partner(s):
Fluor

External Funding Above Match:
$4.8 million

Research Focus:
Interdisciplinary research addressing the multifaceted problems associated with supply chains. Deliver tangible supply chain optimization and logistics products and services through theoretical and applied research.

AUTOMOTIVE SYSTEMS INTEGRATION

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair:
Dr. Paul Venhovens
BMW Endowed Chair in Automotive Systems Integration

Corporate Partner(s):
BMW, Mazda, GM and others

External Funding Above Match:
$1.5 million

Research Focus:
Automotive diagnostics and prognostics, sustainable mobility, concepts, methods and tools. Deriving a simple, flexible energy management control strategy for plug-in hybrid electric vehicles.

AUTOMOTIVE MANUFACTURING

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair:
Recruiting

Corporate Partner(s):
BMW

External Funding Above Match:
$5.6 million

Research Focus:
Develops micro-electromechanical systems technologies for manufacturing and improving the efficiency of manufacturing large, complex objects. The goal is for the Center to be the premier automotive and motorsports research and educational facility in the world.

VEHICLE ELECTRONIC SYSTEMS INTEGRATION

Award Date: 2004

State Award Amount: $3 million

University: Clemson

Endowed Chair:
Dr. Todd Hubing
Michelin Endowed Chair in Vehicle Electronic Systems Integration

Corporate Partner:
Michelin

External Funding Above Match:
$1.5 million

Research Focus:
Research in automotive and vehicular electronics, particularly systems integration issues, electromagnetic compatibility and electromagnetic modeling.

BIOMEDICAL

ADVANCED TISSUE BIOFABRICATION

Award Date: 2008

State Award Amount: $5 million

Universities: Clemson, MUSC, USC

Endowed Chairs:
Recruiting endowed chairs in Biofabrication Biology and Biofabrication Engineering

Research Focus:
Develop innovative technologies and approaches that will enable repair, replacement, or restoration of diseased cells, tissues and organs.

BRAIN IMAGING

Award Date: 2003

State Award Amount: $5 million

Universities: MUSC, USC

Endowed Chairs:
Dr. Chris Rorden, USC
Brain Imaging

Dr. Joseph Helpern, MUSC
Brain Imaging

MUSC is recruiting an additional chair

External Funding Above Match:
$2.1 million

Research Focus:
Creating a world-class brain imaging center. Initiated the first study using transcranial magnetic stimulation (TMS). Combined with functional MRI, TMS provides a short strong magnetic field useful for studying how the brain works. Specific studies include stroke-related brain injury and MRI physics techniques for clinical and neuroscience research.

PROSTATE CANCER DISPARITIES

Award Date: 2008

State Award Amount: $3.6 million

University: MUSC, USC, SC State University

Endowed Chairs:
Dr. Chanita Hughes-Halbert
AT&T Distinguished Endowed Chair in Cancer Equity in Cancer Disparities

MUSC and USC are each recruiting a chair in Cancer Disparities.

Corporate Partner(s):
AT&T Foundation

External Funding Above Match:
$22.5 million

Research Focus:
Facilitate statewide partnerships in cancer prevention and control research, clinical trials, and training to significantly decrease disparities in prostate cancer incidence and mortality in South Carolina.

CHILDHOOD NEUROTHERAPEUTICS

Award Date: 2006

State Award Amount: $5 million

Universities: USC, MUSC

Endowed Chairs:
MUSC is recruiting an endowed chair in Neurodevelopmental Dysfunction.

Dr. Jeffrey Twiss, USC
Child and Adolescent Neurobiology

External Funding Above Match:
$7.2 million

Research Focus:
Prevention of brain damage in premature infants and curing infant brain diseases through cellular engineering. Also working on cognitive behavioral tasks in transgenic mice to determine if therapeutics can improve functional development outcomes, which may someday help children with ADHD.

CLINICAL EFFECTIVENESS AND PATIENT SAFETY

Award Date: 2005

State Award Amount: $5 million

Universities: MUSC, USC

Endowed Chairs:
Dr. John Schaefer, MUSC
Lewis Blackman Endowed Chair for Patient Simulation & Research for Health Sciences South Carolina

Dr. Jihad Obeid, MUSC
Biomedical Informatics

Rita Snyder, USC
Clinical Effectiveness & Patient Safety

External Funding Above Match:
$9.8 million

Research Focus:
Quality and safety of patient care, and improving the medical informatics aspects of data acquisition and the evaluation of health information technology on the quality and safety of clinical care processes and outcomes. The Center also focuses on developing South Carolina as a training center for physicians and other health professions using human simulators and sophisticated software-based training scenarios.

BIOMEDICAL

HEALTHCARE QUALITY

Award Date: 2006

State Award Amount: $5 million

Universities: USC, MUSC

Endowed Chairs:
Dr. Jay Moskowitz, USC
James B. Duke SmartState Endowed Chair in Health Care Quality

MUSC is recruiting one chair.

Corporate Partner:
The Duke Endowment

External Funding Above Match:
$20 million

Research Focus:
Creating a unique and comprehensive clinical data store that collects data from providers, enhances data usability, and makes it available in an easily accessible form for participants to use for clinical improvement and research purposes.

HEALTH FACILITIES DESIGN AND TESTING

Award Date: 2007

State Award Amount: $2 million

University: Clemson, MUSC

Endowed Chair:
Clemson is recruiting a chair in *Architecture & Health Research.*

MUSC is recruiting a chair in *Human Factors Medical Research.*

External Funding Above Match:
$1.4 million

Research Focus:
The impact of health facility design on health and healthcare delivery and the creation of architectural settings that provide better support for the health, safety, and wellbeing of patients and staff.

INFLAMMATION AND FIBROSIS RESEARCH

Award Date: 2010

State Award Amount: $5 million

University: MUSC

Endowed Chairs:
MUSC is recruiting two endowed chairs, *Inflammation Research* and *Kitty Trask Holt Endowed Chair for Sclerderma Diseases.*

External Funding Above Match:
$9.2 million

Research Focus:
Develop new therapies and education programs for inflammatory and fibrosing rheumatic diseases such as lupus, scleroderma, and rheumatoid arthritis.

MARINE GENOMICS

Award Date: 2003

State Award Amount: $4 million

Universities: MUSC, USC, College of Charleston

Endowed Chairs:
Dr. Louis J. Guillette, MUSC
Marine Genomics

Dr. Gavin Naylor, MUSC
Bioinformatics

Dr. Stephan Kresovich, USC
Marine Genomics

External Funding Above Match:
$8.7 million

Research Focus:
Monitoring and predicting the impact of environmental changes on marine biosystems, which can, in turn, affect human health. Specific areas of study include environmental causation in wildlife, human disease and susceptibility, and mapping variability in genomes and populations; as well as research of shark and ray species.

MOLECULAR PROTEOMICS IN CARDIOVASCULAR DISEASE AND PREVENTION

Award Date: 2006

State Award Amount: $5 million

University: MUSC

Endowed Chairs:
MUSC is recruiting two chairs.

External Funding Above Match:
$3.4 million

Research Focus:
Translation advances in basic bench science to clinical bedside care to improve the health care of the citizens of South Carolina. Priorities include diagnostic techniques, therapeutic management strategies, relations of protein signatures to clinical outcomes for risk assessment, and treatment of disease manifestation.

NEUROSCIENCE

Award Date: 2003

State Award Amount: $3 million

University: MUSC

Endowed Chairs:
Dr. Gary Aston Jones
William E. Murray Endowed Chair in Neuroscience

MUSC is recruiting an endowed chair in Movement Disorders.

MUSC is recruiting Josephine Tucker Morse Endowed Chair in Parkinson's Research.

External Funding Above Match:
$10.9 million

Research Focus:
Brain neuromodulatory systems and their roles in cognitive performance, drug abuse, sleep and affective disorders. Other areas of research are movement disorders such as Ataxia, Choro, Bradykinesia and multiple system atrophy.

BIOMEDICAL

PROTEOMICS

Award Date: 2003

State Award Amount: $4 million

University: MUSC

Endowed Chair:
Dr. Richard Drake

MUSC is recruiting a second chair.

External Funding Above Match:
$20.6 million

Research Focus:
Develop and use high-end analytical technologies to understand the biologic profile of protein expression in health and disease. Developing enzyme-based analytical methods to effectively detect biomolecules in tissues and tissue microarray platforms.

REGENERATIVE MEDICINE

Award Date: 2003

State Award Amount: $5 million

Universities: MUSC, USC, Clemson

Endowed Chairs:
Dr. Richard Swaja, MUSC
Regenerative Medicine and Cell Biology

Dr. Martin Morad, USC
BlueCross BlueShield of SC Foundation Chair in Cardiovascular Health

Clemson is recruiting the Hansjörg Wyss Endowed Chair in Regenerative Medicine.

External Funding Above Match:
$37.1 million

Research Focus:
Regenerative medicine approach for cardiovascular applications and provide expertise in clinical trials, statistics and/or assay development. Application of regenerative medicine and tissue engineering approaches to orthopaedic and neural diseases. Regeneration of tissue and organs for repairing, replacing, and maintaining organ function.

REHABILITATION AND RECONSTRUCTION SCIENCES

Award Date: 2007

State Award Amount: $5 million

University: USC

Endowed Chair:
Dr. John Brooks, USC
Reconstructive Methodologies & Materials

External Funding Above Match:
$14.7 million

Research Focus:
Medical health needs in orthopaedic disorders, exercise and sports-related injury prevention, treatment, and rehabilitation. The Center investigates the biologics of tissue-engineered materials and implantable devices to find solutions to musculoskeletal maladies.

RENAL DISEASE BIOMARKERS

Award Date: 2008

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
MUSC is recruiting chairs in *Renal Biomarkers* and *Translational Nephrology Research.*

External Funding Above Match:
$4.1 million

Research Focus:
Identifying biomarkers that identify or predict prognosis for acute kidney injury, diabetic neuropathy, lupus nephritis, and focal segmental alomerulosclerosis.

SENIORSMART™

Award Date: 2007

State Award Amount: $5 million

Universities: USC, Clemson

Endowed Chairs:
Dr. Sue Levkoff, USC
Community & Social Support

USC is recruiting a chair for Memory & Brain Functions.

Clemson is recruiting a chair in *Driving, Mobility & Physical Functioning.*

External Funding Above Match:
$7.2 million

Research Focus:
Three areas of research include: SMARTBrain™ (maintaining intellectual activity), SMARTWheels™ (independent mobility outside the home) and SMARTHome™ (independent mobility inside the home) to foster independent living among seniors.

BIOMEDICAL

STROKE

Award Date: 2007

State Award Amount: $5 million

Universities: MUSC, USC

Endowed Chairs:
Dr. Robert Adams, MUSC
Stroke

Dr. Mark Chimowitz (MUSC)
Countess Alicia Paolozzi Endowed Chair in Translational Neurology

Dr. Souvik Sen, USC
Translational Neurology

External Funding Above Match:
$5.1 million

Research Focus:
Enhancing stroke treatment, prevention, and recovery. This Center is developing new stroke-related therapeutics, drug discovery, and biotechnology, and is a leader in stroke telemedicine.

TECHNOLOGY CENTER TO ENHANCE HEALTHFUL LIFESTYLES

Award Date: 2009

State Award Amount: $3 million

Universities: MUSC, USC

Endowed Chair:
Dr. Frank Trieber, MUSC
Technology Applications to Prevent & Manage Disease & Reduce Risk

Delia West, USC
Technology Application for Health Behaviors Change.

External Funding Above Match:
$11.6

Research Focus:
Develop and test lifestyle interventions for improving health, preventing illness and managing chronic health problems caused by physical inactivity, poor diets, and other lifestyle behaviors.

TOBACCO-RELATED MALIGNANCIES

Award Date: 2007

State Award Amount: $5 million

University: MUSC

Endowed Chairs:
MUSC is recruiting the *BMW Chair in Cancer Research* and *Burtschy Family Distinguished Endowed Chair in Lung Cancer Research.*

Corporate Partner:
BMW

External Funding Above Match:
$25.8 million

Research Focus:
Devoted to discovering tobacco-related malignancy biomarkers via clinical trials with a specific focus on tobacco-related cancers. Additionally, the Center is evaluating the specificity and sensitivity of novel biomarkers by molecular epidemiologic techniques across the diverse populations of South Carolina.

TRANSLATIONAL BIOMEDICAL INFORMATICS

Award Date: 2013

State Award Amount: $2 million

University: MUSC

Endowed Chair(s):
MUSC is recruiting one chair.

Research Focus:
The new Center will provide expertise in translational biomedical informatics essential for cutting-edge, innovative methodologies to link genetic/genomic data with vast amounts of clinical data. The contributions of the center to data sharing/analysis will decrease cost and increase efficiency in research and healthcare delivery and provide a robust IT platform for industry partnerships and new company formation.

VISION SCIENCE

Award Date: 2005

State Award Amount: $4.5 million

Universities: MUSC, USC

Endowed Chair(s):
MUSC and USC are each recruiting a chair.

Corporate Partner(s):
Alcon Labs, Taligen, Alexion Pharmaceuticals

External Funding Above Match:
$18 million

Research Focus:
New treatments for macular degeneration, development of new anti-glaucoma agents and innovations in cataract surgery. The Center also focuses on using advances in bioengineering and material sciences to improve the diagnosis, treatment, and prevention of eye diseases.

FUTURE FUELS

CATALYSIS FOR RENEWABLE FUELS

Award Date: 2005

State Award Amount: $3 million

University: USC

Endowed Chair:
Dr. John Regalbuto

External Funding Above Match:
$2.9 million

Research Focus:
Developing catalysts that allow production of alternative fuels from renewable sources, thereby reducing dependence on imported oil and carbon fuel. The Center focuses on synthesizing inorganic catalysts for converting biomass to biofuels and synthesizing electrocatalysts for solar fuels and fuel cells.

GENERAL ATOMICS CENTER FOR THE DEVELOPMENT OF TRANSLATIONAL NUCLEAR TECHNOLOGY

Award Date: 2009

State Award Amount: $3 million

University: USC

Endowed Chair:
USC is recruiting one chair.

Corporate Partner:
General Atomics

External Funding Above Match:
$3.9 million

Research Focus:
The production of biofuels and coal to liquid fuels using nuclear process heat for more efficient production and the reduction of wastes associated with recycling of used fuel, seeking more long term strategies to manage used fuel, recovery of energy value in used fuel, and eliminating concerns over proliferation associated with recycling used fuel.

HYDROGEN ECONOMY

Award Date: 2004

State Award Amount: $5 million

University: USC

Endowed Chairs:
USC is recruiting two chairs.

Corporate Partner:
Office of Naval Research (projects)

External Funding Above Match:
$21.6 million

Research Focus:
Advance the science and use of clean, secure and renewable energy technologies and transportation fuel, including hydrogen fuel cells.

NUCLEAR SCIENCE AND ENERGY

Award Date: 2008

State Award Amount: $3 million

University: USC

Endowed Chair:
Dr. Dan Gabriel Cacuci

Corporate Partners:
Duke Energy, Progress Energy, SCANA, Westinghouse

External Funding Above Match:
$5.8 million

Research Focus:
Performance, efficiency, and maintenance issues at existing and future nuclear power plants using expertise modeling and simulation related to nuclear fuels and materials.

SMART GRID TECHNOLOGY

Award Date: 2013

State Award Amount: $5 million

University: Clemson

Endowed Chair:
Clemson is recruiting endowed chairs.

Corporate Partner:
Duke Energy

Research Focus:
Develop technology to better manage global electric grid systems.

SOLID OXIDE FUEL CELLS

Award Date: 2006

State Award Amount: $3 million

University: USC

Endowed Chair:
Dr. Kenneth Reifsnider

External Funding Above Match:
$54 million

Research Focus:
Develop solid oxide fuel cells for use in large, high-power systems such as industrial sites and electricity generating stations as well as for mobile power for computers, cell phones, and other electronics.

STRATEGIC APPROACHES TO THE GENERATION OF ELECTRICITY (SAGE)

Award Date: 2007

State Award Amount: $5 million

University: USC

Endowed Chair:
Dr. Jochen Lauterbach

External Funding Above Match:
$9.8 million

Research Focus:
Developing, improving, and advancing technologies to enhance the environmental performance of electricity production. Other work focuses on converting CO_2 to chemicals, fuel cell and hydrogen storage-related research, and chemical production from coal to biomass.

INFORMATION SCIENCE

CYBERINSTITUTE

Award Date: 2008

State Award Amount: $2 million

University: Clemson

Endowed Chair:
Clemson is recruiting the *C. Tycho Howle Endowed Chair in Collaborative Computing Environments*

Corporate Partner:
Omnibond Systems, LLC

External Funding Above Match:
$1.4 million

Research Focus:
Connecting research and scholarship, particularly in the fields of human computer interaction, data storage, interpretation, and visualization to the commercial sector via strategic industrial partnerships. Conduct research in conjunction with the Clemson University Cyber-Institute.

DATA ANALYSIS, SIMULATION, IMAGING, AND VISUALIZATION

Award Date: 2010

State Award Amount: $2 million

University: USC

Endowed Chair:
Recruiting

External Funding Above Match:
$1.2 million

Research Focus:
Develop technology for transforming data into knowledge concentrating on inline data processing, multi-sensor data acquisition, tissue modeling, atomic scale modeling, and bioimaging.

OPTOELECTRONICS

Award Date: 2008

State Award Amount: $2 million

University: Clemson

Endowed Chair:
Dr. Eric Johnson
PalmettoNet Endowed Chair in Optoelectronics

Corporate Partners:
Advanced Photonic Crystal, Tetramer Technologies

External Funding Above Match:
$2.2 million

Research Focus:
Improving devices, systems, and protocols used in high-speed optical communications networks.

SUSTAINABLE DEVELOPMENT

Award Date: 2010

State Award Amount: $4 million

University: Clemson

Endowed Chair:
Clemson is recruiting the *Thomas F. Hash '69 Endowed Chair in Sustainable Development.*

External Funding Above Match:
$1.7 million

Research Focus:
Developing new technologies to support real-time monitoring and management of natural and built environments through the Intelligent River™ Project. The Center has created a wireless sensor that can monitor and transmit environmental data in real time.

TOURISM AND ECONOMIC DEVELOPMENT

Award Date: 2005

State Award Amount: $2 million

University: USC

Endowed Chair:
Dr. Simon Hudson

External Funding Above Match:
$53,924

Research Focus:
Tourism is a $17 billion industry in South Carolina. The Center conducts cutting-edge tourism and hospitality research initiatives that will improve South Carolina's competitiveness as a tourism destination.

URBAN ECOLOGY AND RESTORATION

Award Date: 2005

State Award Amount: $2 million

University: Clemson

Endowed Chair:
Clemson is recruiting a chair.

External Funding Above Match:
$5.7 million

Research Focus:
Applied research in environmental science and engineering, habitat restoration and water quality management; environmental industry growth; and urban ecology projects in South Carolina.

SMARTSTATE WELCOMES FIVE ENDOWED CHAIRS IN 2012-2013

In 2012, the SmartState Program welcomed five new endowed chairs: Dr. Carolyn D. Britten, Center for Gastrointestinal Cancer Diagnostics, MUSC; Dr. Marek W. Urban, Center for Advanced Fiber Materials, Clemson; and Dr. Xue-Zhong Yu, Center for Cancer Stem Cell Biology and Therapy, MUSC. Dr. Delia Smith West, Endowed Chair of Technology Application for Health Behavior Change, USC; Dr. John Brooks, Endowed Chair in Rehabilitation and Reconstruction Science, USC.

PHARMACEUTICAL

CANCER DRUG DISCOVERY

Award Date: 2005

State Award Amount: $5 million

Universities: MUSC, USC

Endowed Chairs:
Dr. Charles Smith, MUSC
Charles and Carol Cooper Chair in Pharmacy

Dr. John LeMasters, MUSC
GlaxoSmithKline Distinguished Endowed Chair

Dr. Patrick Woster, MUSC
Medicinal Chemistry

MUSC is recruiting a chair in Structural Biology

Corporate Partner:
GlaxoSmithKline

External Funding Above Match:
$15 million

Research Focus:
Advanced biomedical screening technologies to identify disease mechanisms and targets, and also screening drug candidates. Structural biology for target analysis, chemical biology for designing drug candidates, and advanced biomedical screening technologies.

CANCER STEM CELL BIOLOGY AND THERAPY

Award Date: 2008

State Award Amount: $5 million

Universities: Clemson, MUSC

Endowed Chairs:
Dr. Zihai Li, MUSC
Abney Endowed Chair Remembering Sally Abney Rose

Dr. Xue Zhong Yu, MUSC
Biomedical Engineering

External Funding Above Match:
$8.3 million

Research Focus:
Developing new technologies for isolating, growing, and manipulating cancer stem cells. This will enable the Center to find ways to use adult stem cells from bone marrow or organs to treat cancer.

GASTROINTESTINAL CANCER DIAGNOSTICS

Award Date: 2005

State Award Amount: $5 million

University: MUSC

Endowed Chairs:
Dr. Melanie Thomas
Grace E. DeWolff Endowed Chair in Medical Oncology

Dr. Carolyn Britten
GI Malignancy Diagnostic & Therapeutic Trials

Corporate Partner:
Roche Carolina, Bank of America

External Funding Above Match:
$9.1 million

Research Focus:
Clinical and translational gastrointestinal oncology and biomarker development and gastrointestinal (GI) malignancies. Bringing state-of-the-art translational medicine to all GI cancer patients in South Carolina, thereby decreasing the overall impact of cancer mortality and morbidity and closing disparity gaps throughout the state.

LIPIDOMICS, PATHOBIOLOGY AND THERAPY

Award Date: 2009

State Award Amount: $5 million

University: MUSC

Endowed Chairs:
MUSC is recruiting chairs in *Lipidomics & Pathobiology* and *Lipidomics Drug Discovery*.

External Funding Above Match:
$24.6 million

Research Focus:
Develop models for translational research and study of lipidomics and their pathobiology with an emphasis on cancer and inflammation.

MEDICATION SAFETY AND EFFICACY

Award Date: 2008

State Award Amount: $2 million

Universities: MUSC, USC

Endowed Chair:
Charles Bennett

External Funding Above Match:
$2.3 million

Research Focus:
Increasing drug safety and effectiveness, as well as decreasing medication errors by identifying the incidence and significance of adverse drug events.

TRANSLATIONAL CANCER THERAPEUTICS

Award Date: 2004

State Award Amount: $5 million

Universities: MUSC. USC

Endowed Chairs:
Dr. Kenneth Tew, MUSC
John C. West Endowed Chair in Cancer Research

Dr. Igor Roninson, USC
Translational Cancer Therapeutics

External Funding Above Match:
$15.2 million

Research Focus:
Development of new approaches in cancer treatment, including the discovery and development of new drugs. Research also focuses on utilizing mouse models predisposed to cancer to study the impact of gene misregulation and therapeutic agents on tumor development, and the identification and inhibition of new cancer drug targets.

SMARTSTATE ENDOWED CHAIRS

" They are the ones who bring meaning to our lives, who happen to inspire, who spark a fire that we carry with us for the rest of our days, who are but pillars of hope and sometimes sacrifice, life-changers, life-savers, catalysts. "

CHIRAQ TULSIANI

South Carolina's SmartState Centers are led by endowed chairs; they are engineers, scientists, and researchers who are recognized experts in their respective fields.

The role of SmartState endowed chairs is to serve as catalysts for the state's knowledge economy. Eighty-nine endowed chairs have been approved to fill positions at Clemson, MUSC and USC; 44 have been appointed. The universities are actively recruiting for the other positions. We invite you to meet the SmartState endowed chairs.

Dr. Zoran Filipi
Automotive Design and Development
Clemson

Dr. Louis Guillette
Marine Genomics
MUSC

Dr. Joseph Helpern
Brain Imaging
MUSC

Dr. Todd Hubing
Vehicle Electronics Systems Integration
Clemson

Dr. Robert Adams
Stroke
MUSC

Dr. Gary Aston Jones
Neuroscience
MUSC

Dr. Brian Benicewicz
Polymer Nanocomposites
USC

Dr. Charles Bennett
Medication Safety and Efficacy
USC

Dr. Simon Hudson
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USC

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MUSC

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Clemson

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Marine Genomics
USC

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MUSC

Dr. Don Gabriel Cacuci
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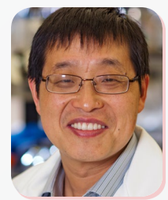

Dr. Xue Zhong Yu
Cancer Stem Cell Biology and Therapy
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CLEMSON UNIVERSITY

CU-ICAR DEEP ORANGE

" CU-ICAR's Deep Orange vehicle prototype project is a game-changer that redefines how industry interacts with universities. How many college students get to work hand-in-hand with partners like BMW, GM, and Mazda? "

PAUL VENHOVENS, Ph.D.

ENDOWED CHAIR, SMARTSTATE CENTER FOR AUTOMOTIVE SYSTEMS INTEGRATION

It's high praise when an automotive industry leader recognizes a South Carolina university's vision to be the world's premier automotive, performance aftermarket, and motorsports research and education facility.

John Waraniak is vice president of technology development for the Specialty Equipment Market Association (SEMA), which hosts one of the automotive industry's premier events each year in Las Vegas. The SEMA Show attracts more than 120,000 attendees and 2,000 exhibitors. CU-ICAR students and their prototype vehicles built as part of the Deep Orange project are becoming regular, high profile participants at the SEMA Show. Waraniak recently cited Deep Orange for "encouraging innovation, entrepreneurship and creativity."

Deep Orange is a ground-breaking, two-year program that teams Clemson automotive engineering students with multidisciplinary faculty like Dr. Paul Venhovens, BMW Chair in Automotive Systems Integration, and corporate sponsors to research, design, engineer, and build a functioning vehicle prototype. To date, students have successfully completed three prototypes with two more in progress.

The list of Deep Orange corporate sponsors reads like a global automotive industry who's who: BMW, GM, and Mazda. Industry suppliers contributing components, software, or services include Michelin, Sage Automotive Interiors, JPS Composite Materials, Ryobi, Kicker Car Stereos, Altair (software), and KTM Solutions (engineering). For students, the opportunity to work with these companies as well as CU-ICAR faculty like Dr. Venhovens who previously worked at BMW's R&D headquarters in Munich, Germany, is a dream come true, moving the educational experience light years beyond textbooks and lectures and preparing them for lucrative careers.

Corporate sponsors find the experience equally rewarding. Mazda sponsored Deep Orange 3, in which CU-ICAR automotive engineering students worked with design students from the Art Center College of Design in California to create a vehicle prototype dubbed "The Next Big Thing" that addresses the needs of Gen Y consumers as well as automotive requirements like fuel efficiency, low carbon footprint, and lightweight materials. Sponsors benefit from the opportunity to identify talented future employees.

"This is a concept vehicle program like no other. Deep Orange 3 was done the Mazda way, with new approaches to lightweight materials and power train technology," said Robert Davis, senior vice president, Mazda North America. "Students did a great job establishing what they wanted to build, developing market research around it, and developing and implementing new techniques of manufacture and design in the car that they built. It's a homerun!"

CORPORATE PARTNER

mazda

POSITIONED FOR THE FUTURE

Thomas Friedman's book, The World Is Flat, was the source of great debate when first published in 2005. The globalization of the world's economy, where every nation competes on a level playing field, was difficult for some to comprehend. What happened to global dominance by a few nations? Was the United States falling behind? How could the nation maintain its status as the world's top economy?

The answer is through innovation. Few countries have the drive to innovate and create novel, game-changing technologies quite like the United States. The need for this drive has never been greater as the world is truly flat.

From the initial vision of the South Carolina General Assembly, the SmartState Program has been the impetus for innovation and economic development in the Palmetto State. Today, South Carolina has strong and growing economic clusters in the automotive, aviation, energy, biomedical, pharmaceutical, and advance materials industries, all of which are of critical importance to the state, nation and the world. These economic clusters are creating opportunities for researchers, students, corporate partners, entrepreneurs, and all South Carolinians for better jobs and quality of life.

The SmartState Program has helped put South Carolina in an enviable position, a state well positioned for the global economy. The program will continue to evolve and improve, keeping South Carolina at the forefront of innovation.

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